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No. 97



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CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 97

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APPLIED SCIENCES

FALSE COLOR SATELLITE MAPPING OF HUBEI PROVINCE COMPLETED

Wuhan HUBEI RIBAO in Chinese 23 Mar 81 p 2

[Article: "False Color Composite Satellite Imagery for Province Completed"]

[Text] Recently, the Provincial Cartographic Bureau successfully completed the mission given it by the State Cartographic General Bureau to make a quantitative soil surface and resource distribution 1:250,000 scale false color composite satellite image for the State Agricultural Commission on a trial basis.

The 1:250,000 scale false color composite satellite image represents a new product of China's survey and cartographic organs. Hubei Province had represented a cartographic blank spot which this recent success has filled.

This is not an object shown in true color but a man-made, enhanced color satellite image which has numerous advantages; it can be read directly and easily. In addition to being employed for quantitative analysis of the soil area and resource surveys, it can also be used for such things as topographical surveys, updating maps, geological prospecting, probing the oceans and monitoring environmental pollution, etc.

CSO: 4008/306

APPLIED SCIENCES

RESEARCH ON MICROWAVE NONTHERMAL EFFECTS ON VISION

Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICA SINICA] in Chinese 1980, Vol 32, No 4, pp 370-373

[Article by Ye Guoqin [5509 0948 2953] and Jiang Huai [1203 2849] of Microwave Research Institute, Zhejiang Medical College: "Effects of Irradiation of Low Intensity Microwave on the ERG B-Wave of the Rabbit"]

[Text] Abstract

The aim of the experiment was to observe the effects of low intensity microwave irradiation on the electroretinographic [ERG] b-wave of the rabbit, and study the nonthermal effects of microwaves on its visual function. The results were as follows:

1. The amplitude of the ERG b-wave dropped significantly during pulsed irradiation of 3 GHz microwave at the power intensity of 0.7 mW per square centimeters repeated at the frequency of 1,875 Hz. At the termination of microwave irradiation, the b-wave recovered its original amplitude within approximately half an hour. Comparative study of 20 rabbits prior to, during and following exposure to the microwave irradiation indicated remarkable changes ($p \leq 0.001$) in the mean value of the ERG b-wave.
2. In a few cases, the b-wave only showed a slight decrease during the microwave irradiation, but at the termination of the irradiation, the b-wave experienced sharp rebounds, sometimes as high as 130 percent.

For quite some time, researchers studying the biological effects of microwaves have disputed the question of whether nonthermal effects can be caused by microwaves which are below 1 mW per square centimeter and lack adequate energy to cause temperature changes in organic tissues (1). Thus, to a certain extent, [this type of research] is of theoretical and practical value.

The aim of the experiment described in this article was at once to observe the the effects of low-intensity single microwave irradiation on the ERG b-wave and to study the nonthermal effects of microwave irradiation on visual function. Altogether, 20 rabbits, each weighing over 2 kilograms, were used in the experiment. For anesthesia, urate ester (?) was injected into the veins of the animals and the depth was controlled at a level just enough to keep the animals in a tranquilized state. The pupils were opened with atropine, adapted to at least over 1 hour of darkness.

The interior walls of the electric screen dark room were covered with a kind of microwave-absorbent material (WXR type) of absorption attenuation > 25 db, refractory index ≤ 0.5 percent, thus turning it into a "microwave darkroom." All the electrodes and light sources in the room were fixed with plastic supports instead of metallic ones, and the animals were put in special wooden baskets, the purpose of which was to prevent microwave reflection(2).

A cotton wick saturated with 0.85 percent NaCl solution was inserted into a 2 mm diameter glass tube and used as a lead electrode. By force of surface tension, the thin end of the cotton wick was attached to the cornea of the eyeball. An extraneous electrode was placed on the scalp between the ears. Both the lead electrode and extraneous electrode passed through the "microwave low-pass filter" (3) so as to keep the microwave from interfering with the bioelectric recorder. Next, the source tracker, preamplifier and double-beam oscilloscope were connected. On the oscilloscopic screen, the upper curve represented the ERG b-wave, and the lower one represented the illuminating mark and standard voltage.

A computer was used to gather samplings of output signals from the oscilloscope, perform analog-to-digital conversion (4), display the superimposed signals on the video screen, and transfer them to the x-y plotter for recording (see Figure 1).

Figure 1 Block diagram of instruments linked to perform experiment on the effects of microwave irradiation on ERG b-wave..

- | | |
|-------------------------|--|
| (1) microwave generator | (10) camera/motor |
| (2) power control | (11) double-beam oscilloscope |
| (3) antenna | (12) x-y plotter |
| (4) low-pass filter | (13) temperature gage |
| (5) source tracker | (14) leak-energy gage |
| (6) microwave darkroom | (15) low-frequency signal source generator |
| (7) preamplifier | (16) delay |
| (8) final amplifier | (17) automatic control |
| (9) computer | (18) timer |

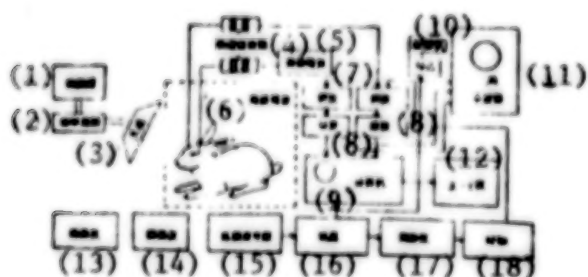


图 1 研究微波辐射对视
网膜电位影响的实
验仪器连接方框图

A low-frequency signal source was used as the chief timer, and its output pulses passed through an automatic controller into four separate circuits to trigger the oscilloscopic scanning, control computer sampling, start the camera motor and release the camera shutter. Some of the output pulses also went through the delay circuit to trigger the light source after 1 ms delay, thus giving the animals photic stimulation of 1 minute fixed intervals and 1 second light exposures. Through a lens system, the light source formed images inside the pupils. The images measured approximately 3×2 mm.

We used a 3 GHz pulsed radar, and the animals were subjected to irradiation repeated at 1,875 Hz. A microwave leak-energy measurement instrument was used to gage the field intensity. The intensity of the field portion which the rabbit heads were exposed to was maintained at 0.7 mw per square centimeters by the microwave power control.

After the rabbits became fully adapted to the darkness, the ERG b-wave amplitude became relatively stable (see Figure 2,a), and stayed at approximately 0.2-0.5 mV under the photic stimulation conditions maintained throughout the experiment. To enhance the precision of the experiment, we also produced superimposition graphs of ERG b-waves through 20 light exposures recorded by an x-y plotter (Figure 3,a). Then, the animals were exposed to microwave irradiation. In most cases (16 rabbits), the b-wave dropped significantly following 3-4 hours of irradiation (Figure 2,b,c), and some even dropped 50 percent. Besides decreasing b-waves, increases in c-waves were also observed. The responses to microwave irradiation varied with each individual rabbit. In some cases, the b-wave began to decline after 1-2 hours of irradiation. But there were also cases which took 6-7 hours of exposure. Following the remarkable b-wave decrease, no further decline was observed as the microwave irradiation continued; the amplitude variation of the b-wave throughout the entire microwave irradiation process is shown in Figure 4.

There were only a small number of cases (four rabbits) in which the b-wave amplitude failed to drop significantly; but the b-wave rebounds were extremely remarkable, sometimes as high as 130 percent. When the tests were repeated on this particular type of animal, after a few days of rest, the b-waves also rebounded repeatedly.

Comparative study of 20 rabbits prior to, during and following their exposure to the irradiation indicated extremely remarkable changes ($p < 0.001$) in the mean value of the ERG b-wave (Figure 5). Following the termination of the microwave irradiation, the b-wave recovered its original amplitude.

Some reports have been published regarding experimental research on the nonthermal effects of microwaves. In 1961, A. H. Frey discovered the auditory system response to low-intensity pulsed microwaves (5); in 1968, he discovered heart rate variations caused by low-intensity microwaves (6); in 1975, he observed changes in the blood-brain barrier system and behavior (7). C. Asabaev has also published a report on electrocorticographic changes caused by microwaves (8). The results of our work indicate that low-intensity microwave irradiation can also exert a certain degree of influence over the ERG b-wave.

In our experiment, the intensity of the microwave irradiation was set at 0.7 mw per square centimeter, which was generally regarded as nonthermal effect intensity. In addition, by measuring the temperature inside the vitreous body with a comprehensive temperature gage (error: 0.2 degrees Centigrade) prior to and after the microwave irradiation, it was determined that the temperature did not rise at all. Thus, we believe that the decline in ERG b-wave did not result from temperature rise.

As our experiments often lasted approximately 14 hours, could it be that the decrease in ERG b-wave was caused by lack of oxygen or the accumulation of some kind of metabolic product in the animals? However, at the termination of the

microwave irradiation, the b-wave in most cases (15 of our 16 rabbits) restored the same amplitude as prior to the irradiation within the span of half an hour. Moreover, even in the few cases (four rabbits) where the animals had not experienced any significant b-wave reduction during the irradiation, the b-wave rebounds occurred as soon as the irradiation stopped, and the amplitude increased way above the original value. Thus, there is no possibility at all.

In the experiment, the b-wave began to decline after 1-2 hours of microwave irradiation in most cases. In some cases, the animals did not begin to respond to the microwave irradiation until 6-7 hours after the exposure. The influence of the microwave irradiation over visual function varied from one individual rabbit to another. Similar individual differences were also observed in our experiments on the effect of microwave irradiation on heart function (9), as well as in Chow's research on microwave induced cochlear microphonics (10).

The authors wish to express special thanks to comrades Li Ningguo [2621 1380 0948] and Yu Zhiping [0151 1807 1627] for designing and making the automatic controller, and to comrades Jiang Xiaohang [5592 1420 2635] and Hua Jinzhong [5478 6855 0022] for participating in some of the experimental work.

Figure 2 ERG b-waves

- a. prior to microwave irradiation
- b. 3 hours after microwave irradiation
- c. 4 hours after microwave irradiation
- d. at the moment when microwave irradiation was terminated

standard voltage: 0.2 mV

time scale: 1 second

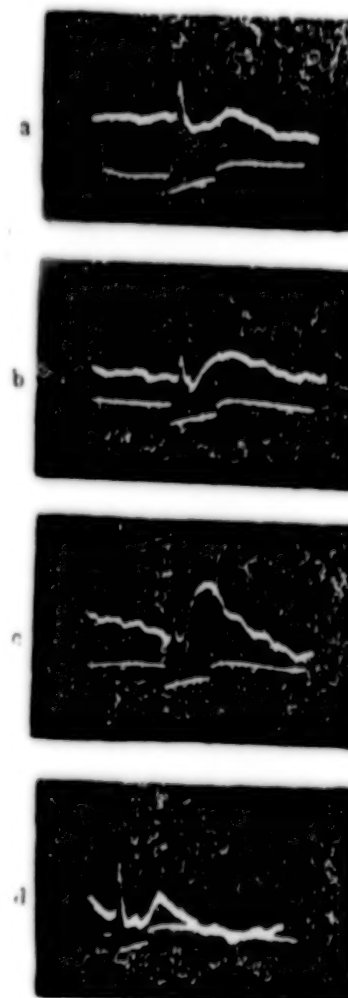


图 2 视网膜电图 b 波

- a. 照射前
- b. 照射后 3 小时
- c. 照射后 4 小时
- d. 照射终止瞬间

标准电压: 0.2 mV, 时间: 1 秒

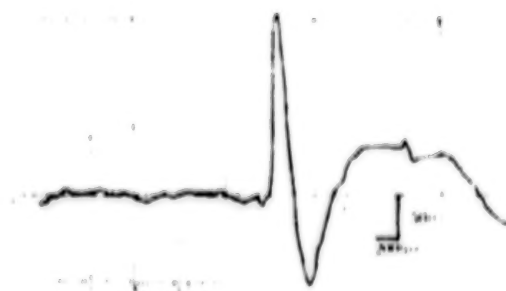
Figure 3 ERG b-wave graphs superimposed by the computer

- a. prior to microwave irradiation
- b. 3 hours after microwave irradiation
- c. at the moment when irradiation was terminated

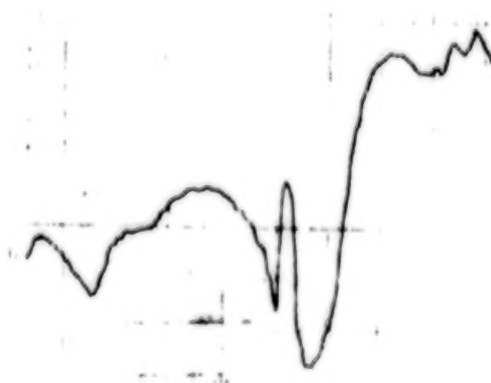
standard voltage: 50 mV;

time: 200 ms;

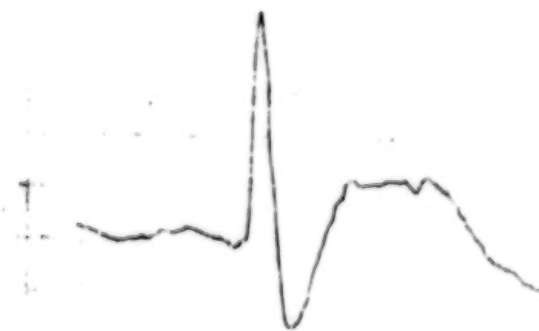
rabbit No. 13



a



b



c

图 3 视网膜电位电子计算机迹加图

- a. 微波照射前。
- b. 微波照射后 3 小时。
- c. 停照瞬间。标准电压 50mV 时间 200ms
No.13 家兔。

Figure 4 Influence of microwaves on ERG b-wave amplitude

Horizontal axis represents experimentation time; ↑ is microwave irradiation; ↓ is termination of microwave irradiation; vertical axis represents percentage of wave amplitude; rabbit No. 15

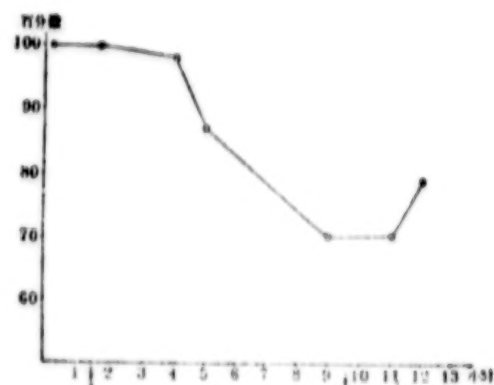


图 4 微波对视网膜电位 b 波振幅的影响
横轴标表示实验时间, ↑ 为微波照射, ↓ 为微波
停照, 纵轴标表示 b 波振幅的百分数, No.15 家兔。

Figure 5 the mean amplitude of ERG b-waves (20 rabbits)

Comparison between (1) prior to irradiation, (2) during irradiation, and (3) after irradiation. Vertical axis is millivoltage.

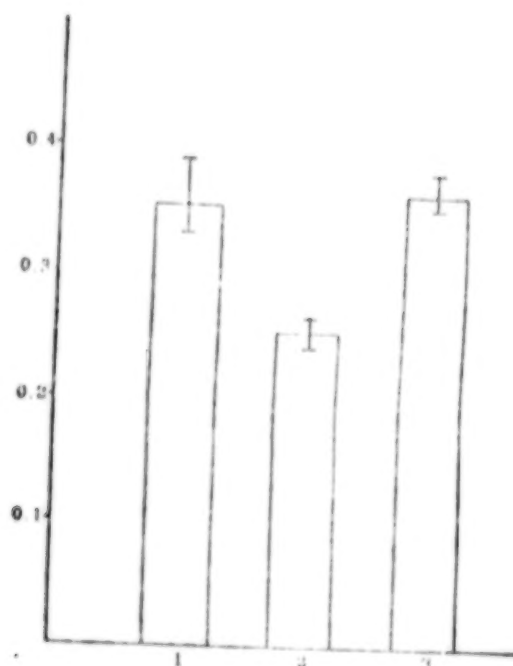


图 5 视网膜电位 b 波振幅平均值 (20 只家兔)
照射前 (1), 时 (2), 后 (3) 均值, 纵轴标
为毫伏值。

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1550

CSO: 4008/281-A

APPLIED SCIENCES

BRIEFS

SICHUAN INSTRUMENT, METER CONFERENCE--The 1981 national conference for ordering instruments and meters opened at the Sichuan exhibition hall on 26 March. Some 2,000 representatives are taking part in the conference. The products on display are divided into 14 main categories in which there are 3,000 varieties that can be adopted to meet 20,000 specifications. [Chengdu Sichuan Provincial Service in Mandarin 2300 GMT 26 Mar 81]

SHANGHAI AUTOMATION SOCIETY--(Tu Xinfang), president of the Shanghai Municipal Automation Society, said at a recent meeting of the society's board of directors that scientists and technicians should be chiefly concerned about research in applied technology and apply the results of their researches to production processes. They should not only delve into technological but also economic matters, paying equal attention to advanced technology and its economic rationality. [Shanghai City Service in Mandarin 2300 GMT 26 Mar 81]

CSO: 4008/308

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TITLE: "Strata of Quaternary Transgressions in East China: A Preliminary Report"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 55 No 1, 1981 pp 1-13

TEXT OF ENGLISH ABSTRACT: As revealed by micropaleontological analyses of the onshore and offshore drilling cores, the Quaternary Period witnessed four marine transgressions in east China, namely:

Ammonia transgression (Q_4 , occurring during the last 10,000 years),

Pseudorotalia transgression (Q_3 , 39,000 - 24,000 B.P.),

Asterorotalia transgression (Q_2^1 , 100,000 - 70,000 B.P.),

Spirillina transgression (Q_2 , ca 300,000 B.P.).

The Middle Pleistocene transgression (i.e., Spirillina transgression) is characterized by its limited areal distribution and low degree of marines. The next two (Asterorotalia and Pseudorotalia) transgressions took place in Late Pleistocene and are distinguished by their wider areal distribution and seawater invasions

[Continuation of DIZHI XUEBAO Vol 55 No 1, 1981 pp 1-13]

along river valleys. The warm water foraminifers and molluscs, such as Asterorotalia, Pseudorotalia and Oliviella, occur in strata formed by these two transgressions from the Yellow Sea and the Bohai Gulf regions, suggesting a temperature warmer than now. The postglacial Ammonia transgression exceeded in extent the previous ones resulting in a wider distribution of the Holocene marine deposits along the coastline. In addition to the four transgressions mentioned above, microfaunal evidence was found for another marine transgressive-regressive sequence of uncertain age, belonging probably to the beginning of Pleistocene or the end of Pliocene.

The micropaleontological approach is adopted in the present study, but paleomagnetic and radiocarbon dating, playnology and lithology are involved in the discussion of the ages of transgressions. In addition to the time and scope of transgressions, considered here are factors of paleoenvironments, such as water temperature, depth and salinity, as well as faunal changes. Moreover, the trends of neotectonic movements are discussed based on the burial depth of the transgressive strata.

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TITLE: "Discovery of Evolutononion shanxiense Gen. et Sp. Nov. and Its Stratigraphical and Paleogeographical Significance"*

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 55 No 1, 1981 pp 14-19

TEXT OF ENGLISH ABSTRACT: The well-preserved foraminiferal specimens, named here as Evolutononion shanxiense gen. et sp. nov., were isolated from two core samples collected from the Late Quaternary deposits at the depth of 77 m to 83 m in the Yuncheng Basin, Shanxi Province. About 1000 foraminiferal specimens were obtained, but they are composed of only one species which is associated with numerous ostracods, such as Ilyocypris, Candona, Candoniella, Cyprideis, Limnocythere and Eucypris, small bivalves such as Corbicula and some otoliths. Evolutononion differs from Nonion by its semievolute adult stage of test and is similar to the latter in the early stage of development. The present discovery suggests the presence of a Late Quaternary transgression in the Yuncheng Basin and adjacent areas.

* This paper was written in 1962 and published in abstract in 1964.

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TITLE: "The Deep Geological Structure of Yunnan and Its Adjacent Areas"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 55 No 1, 1981 pp 20-28

TEXT OF ENGLISH ABSTRACT: In the present paper the bathymetric line of the Moho for Yunnan and its adjacent areas is obtained based on the anomalous gravity field, and an integrated analysis is made in combination with magnetic, seismic and geologic data and satellite images. Moreover, in the light of the subsurface geology at depth, the whole region is divided into four main massifs, all bounded by depth-fracture belts, with identity as well as difference between the deep and shallow structures. These areas show a great diversity in geologic background at depth, complete difference in the trend of geologic structures and certain variations in structural layers within the crust. The depth background for part of the useful minerals is discussed and regional potentiality of prospecting for some minerals is indicated. In addition, earthquake occurrences in part of the areas are correlated and interpreted in the light of depth geology, and several relevant problems are discussed.

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TITLE: "Composition and Evolution of Cenozoic Basaltic Rocks in Southeastern Coastal Provinces of China"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 55 No 1, 1981 pp 29-40

TEXT OF ENGLISH ABSTRACT: Cenozoic basalts are widely scattered in a zone lying about 350 km in width which is near the coastline in the southeastern provinces of China. They may be divided into the Early Tertiary, the Late Tertiary and Quaternary basalts respectively. Among the three cycles of basalt eruptions, the late Tertiary one is the most widespread. It is now known that in a given region only one cycle of basalts occurs generally, but in rare cases two cyclic basalts may be found together. In each cycle, the "alkalinity" of the basalts tends to increase progressively. For example, the earlier members of the Early Tertiary period are olivine basalts, which gave way to alkali olivine basalts in the later stage; similarly, the basalts of the Late Tertiary and Quaternary periods vary from tholeiite and olivine tholeiite to alkali olivine basalt and basanite. On the whole, they form a mixed but predominantly alkaline basaltic province.

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Based on the mineralogical and petrochemical characteristics, the tholeiite is referred to the continental type and to the pigeonite series, in which the ferro basalt and pyroxene anorthosite are enclosed as inclusions. The ferro basalt is considered to be the end product of magmatic differentiation, while the pyroxene anorthosite might originate from earlier crystal accumulation in the magma reservoir. Most of the alkali olivine basalts belong to the soda-series, but some lesser members occurring in late stages tend to be enriched in potash. The alkali olivine basalts often display a series of regular changes in petrochemical and mineralogical properties due to fractional crystallization and contamination. In addition, tholeiite basalts occur close to the seacoast only, whereas in the inland areas only alkali basalts are found. It is thus postulated that the successively increased depths of the magma chambers, as well as the depth of fracture zones, might be due to the plate movement. As for the sequence of eruption, the tholeiitic basalts appear to erupt prior to the alkaline ones.

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TITLE: "On Iron Deposits Formed from Volcanogenic-Hypabyssal Ore Magma"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 55 No 1, 1981 pp 41-54

TEXT OF ENGLISH ABSTRACT: Since the discovery of Laco magnetite lava flow deposits, other iron deposits of volcanogenic ore magma origin have been found in other parts of the world, e.g., Manyang (Yunnan, China), Chogart (central Iran), etc. The presence of pilotaxitic texture, amygdaloidal structure and fluidal structure constitutes an outstanding feature of Manyang iron ore and serves to distinguish it from many non-ore-magmatic or hypabyssal ore-magmatic iron deposits. In addition, Gushan (Anhui, China), Heliyingshan (Nei Monggol, China), Dongka (Tibet, China) and other deposits are similar to those of the Kiruna type and belong to hypabyssal ore magma iron deposits.

A genetic classification of the world-wide volcanogenic-hypabyssal ore magma iron deposits is proposed in this paper with a brief description of their main

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characteristics. The major types are as follows:

- I. Iron deposits of volcanogenic ore magma origin
 - Ia. Spillite-keratophyre type; e.g., Manyang deposit;
 - Ib. Andesite type; e.g., Laco deposit;
 - Ic. Rhyolite-trachyte type; e.g., Chogart deposit.
- II. Iron deposits of hypabyssal ore magma origin
 - IIa. Gabbro-diorite type; e.g., Dahongshan deposit, etc.;
 - IIb. Diorite (or diorite porphyrite) type; e.g., Gushan deposit, Dongka deposit, etc.;
 - IIc. Granite type; e.g., Pea Ridge deposit, etc.;
 - IId. Plagioclase granite type; e.g., Heliyingshan deposit, etc.;
 - IIe. Albite syenite type; e.g., Kirunavala deposit, etc.;
 - IIf. Alkaline rock type; e.g., Buhera deposit, etc.

According to different ore provenances of the above-mentioned iron deposits, they may be divided into the following five types: (1) basaltic magma; (2) andesitic magma; (3) granitic magma; (4) alkaline magma; and (5) remelting mass of ferruginous rock series or iron formations.

The problem of geotectonic environment of these deposits has been discussed in the last section of this paper. The proposed geotectonic environment patterns of volcanogenic-hypabyssal ore magma iron deposits are as follows:

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- (1) Eugeosynclinal fold belt, i.e., Kiruna pattern (e.g., Kirunavala, Pea Ridge, Liangyun, Manyang, Wenduermiao, Heiyingshan, Dahongshan, Anzass, Goroblagodat, etc.)
- (2) Continental margin orogenic zone; i.e., Chile pattern (e.g., Laco, El Romeral, Cerro Mercado, Dongka, etc.)
- (3) Fault depression; i.e., Nanjing-Wuhu pattern (e.g., Gushan, Meishan, Shibatai, etc.)
- (4) Deep fault belt; i.e., Rhodesia pattern (e.g., Buhera, Xinpuzi, Kordovsk, etc.)

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TITLE: "The Metallogenic Geological Features and Ore Source of a Stratabound Gold-Silver Deposit in China"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 55 No 1, 1981 pp 55-66

TEXT OF ENGLISH ABSTRACT: The deposit under discussion lies in a particular stratigraphic horizon of a low-grade metamorphic volcanic-sedimentary sequence. The ore bodies occur in the stratoid and lenticular forms, and are controlled strictly by the strata.

There are several factors controlling ore formation, but the leading ones are the ore source and the strata. The primary source of gold and silver is submarine volcanoes. Deposition of the ore material provided by volcanoes gave rise to a set of ore source beds enriched in gold, silver and other metals. Although the strata control the position and form of the ore bodies, the sites with the most important concentrations of metals are governed by structures.

[Continuation of DIZHI XUEBAO Vol 55 No 1, 1981 pp 55-66]

Ore-forming processes are complicated. After the ore material derived from volcanic activity got into sedimentary strata, ore source beds were formed; however, only after it underwent regional metamorphism could the deposit be formed, because the derivative hydrothermal solutions promoted the mobilization, migration and concentration of the metals in the ore source beds, and caused them to be redeposited under favorable physico-chemical environments and appropriate geological conditions.

This is a quite characteristic stratabound gold-silver deposit which was formed by metamorphic-hydrothermal activity and whose ore material originated from host rocks.

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TITLE: "Evolution of the Holocene Changjiang Delta"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 55 No 1, 1981 pp 67-81

TEXT OF ENGLISH ABSTRACT: This paper deals with the characteristics of the evolution of the Holocene Changjiang Delta based on the analysis of lithological facies and paleogeography. It is concluded that six successive stages could be distinguished since the beginning of Holocene, that is the Hongqiao, Huangqiao, Jinsha, Haimen, Chongmin and Changxing stages in geochronological order. From them, six corresponding subdeltas have been developed.

Distinct from the other deltas of the world, the system of these six subdeltas has developed into a unique pattern and is marked by the following features:

- 1) The sequential positions of subdeltas are arranged in steps trending from north-west to southwest.
- 2) The axes of the subdeltas are so oriented that they turn gradually more and more to the southeast and each subdelta offlaps its predecessor.

[Continuation of DIZHI XUEBAO Vol 55 No 1, 1981 pp 67-81]

3) In space the subdeltas are of imbricate arrangement, and no obvious destructional stage intervenes between two successive subdeltas.

4) The sedimentation rates of all the six subdeltas are approximately the same, but those of different parts of a subdelta are variable. The average rates for the formation of river mouth bars, delta-front slopes and prodeltas are 1.4 cm/y, 0.54 cm/y and 0.31 cm/y respectively. The progradation rates of the subdelta plains are different, too, the rates of the young subdeltas generally being faster than those of the old ones. The average rate of progradation of the Changjiang Delta is 40 m/y.

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TITLE: "Selective Flotation of Beryl and Its Separation from Spodumenite"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 249-262

TEXT OF ENGLISH ABSTRACT: The selective flotation of beryl, especially its separation from spodumenite, has been investigated. For flotation of beryl and separation from gangue minerals in alkaline medium, the reasonable adjustment between the activating factor, Ca^{2+} , and the depressing factors, such as CO_3^{2-} , etc., was ascertained. Thus, the unfavorable effects of "unavoidable ions" in slurry and in hard water on flotation were remarkable eliminated. As a result, a "flow sheet of selective flotation of beryl and its separation from spodumenite" is developed in which it is entirely possible to float beryl or spodumenite and even their complex ores with various natural waters. This seems to be advantageous to no washing for deslime or other special treatments, easy supply of reagents, less expansive, and simple, adaptable and flexible operation. Commercial tests verified that beryl concentrate assaying 9.2 - 10.8 percent BeO with recovery of 88-80 percent has been yielded from ore containing 0.3 percent BeO , and also that beryl or

[Continuation of JINSHU XUEBAO Vol 16 No 3, 1980 pp 249-262]

spodumenite concentrate assaying 8.5 percent BeO or 6.0 percent Li_2O with recovery of 69 percent or 88 percent respectively from a complex ore containing 0.055 percent BeO and 0.93 percent Li_2O . The flow sheet has been carried into industrial mills with great success.

AUTHOR: ZHAO Tongwu [6392 4827 2976]

ORG: Changsha Institute of Mining and Metallurgy Research

TITLE: "A Study of the Efficiency of Percussive Penetration by Wave Theory"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 263-275

TEXT OF ENGLISH ABSTRACT: Using uni-dimensional stress wave theory, the penetration function of arbitrarily incident stress has been derived. For any given long rod-hard rock penetration system with single or double cylindrical piston, the coefficient of the penetration depth of each step (u_k) is a linear transform of a pulse-shape vector (ψ_k), and can be expressed by means of matrix or recurrent formula as: $(u_k) = (a_{kp})(\psi_k)$ or $u_k = u_{k-1}e^{-\lambda} + \psi_k$, therefore, the penetration efficiency is

$$\eta = 4\theta(1 - e^{-\lambda})^2(\max u_k)^2$$

where (a_{kp}) is the characteristic square matrix of the system; λ and θ are constants.

Attempts have been made to compute the penetrating efficiency of the double cylindrical piston with different cross section characteristics by a digital computer, with the shake to head length ratio $j = 4$ or 5 , which is the normal value for engineering design. The single cylindrical piston may be regarded as a particular case of the double one.

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Due to the fact that all arbitrary specific incident stress pulses can be approached by a step function with a sufficiently short period Δt , this method may be applicable to the calculation of the efficiency of penetration with arbitrary stress pulse.

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TITLE: "Three-dimensional Orientation Analysis for Cold-rolled 08Al Steel Sheet"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 276-282

TEXT OF ENGLISH ABSTRACT: An ALGOL-60 program is written for the calculation of the ODF for cubic metals. Using this program, the cold-rolled texture of 08Al steel sheet has been determined. It is shown that this texture is composed of two branches: the weaker one is concentrated $\{001\} \langle 1\bar{1}0 \rangle$, the other has a stronger $\{\bar{1}11\}$ fiber component and a strong $\{\bar{2}11\} \langle 0\bar{1}1 \rangle$.

In this program the ODF is expanded in a series of generalized spherical harmonics truncated at $l = 16$ and is inversed from two pole figures of the sample. The weights a_l^i have been introduced in the calculation of the coefficients W_{lmn} of the series for $l = 4, 6, 8, 10, 14$. It has been proved that a_l^i is determined by the Θ_i , Φ_i and l , and is independent of the orientation distribution of the plane i in the samples. Furthermore, the numerical values of $Z_{lmn}(\xi)$ are calculated by a simple recurrence relation. The program, as a whole, is rather simple and time-saving.

AUTHOR: LIU Qin [0491 0534]

ORG: Shanghai Jiaotong University

TITLE: "A Study on the Initial Carbides Formed during Isothermal Decomposition of Austenite in Chromium Steel"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 283-289

TEXT OF ENGLISH ABSTRACT: Carbides formed initially during isothermal decomposition of austenite in seven chromium steels have been studied by the X-ray diffraction method. The relationships existing between Cr/C ratio and types of initial carbides formed have been confirmed and re-explained by a new concept. It was also found that the carbide-forming process is dependent on the decomposition temperature of austenite. With different Cr/C ratios and decomposition temperatures, the types of the initial carbides formed are different. Transition regions possibly exist between any two adjacent single phase regions in all diagrams.

AUTHOR: XIA Guangxiang [1115 0342 4382]
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TITLE: "Studies on the Kinetics of Nickel Dissolution in Aqueous Ammoniacal Solution"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 290-301

TEXT OF ENGLISH ABSTRACT: Studies have been carried out on the kinetics of Ni dissolution in aqueous solution of NH_3 and $(\text{NH}_4)_2\text{CO}_3$ with O_2 present. It is shown that the NH_3 and NH_4^+ salt dissolution of Ni is an electrochemical reaction accompanied by surface oxidation of Ni by O_2 . The reaction rate may be either in the NH_3 concentration control region or in the O_2 concentration control region depending on the ratio of the concentration of NH_3 and that of O_2 .

In the NH_3 controlling region, the surface of Ni will be passivated rather easily with the formation of oxide film. The dissolution reaction will then be interrupted. In the O_2 controlling region, the rate of reaction will be controlled by the rate of O_2 transfer through the liquid film around the Ni surface. It can be correlated with the equation of the rate of O_2 mass transfer.

AUTHOR: ZHOU Yigang [0719 5030 0474]

ORG: Northwest Engineering Institute

TITLE: "An Investigation of the Thermal Stability of Ti-679 Alloy"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 302-307

TEXT OF ENGLISH ABSTRACT: The effect of specimen shape, degree of deformation by forging, surface contamination of O_2 , chemical composition and microstructure on the brittle fracture of Ti-679 alloy subjected to the creep test at 450°C for 100h has been studied. The thermal stability of the alloy close to the α -region was not only related to the alloy composition, but also to the microstructure formed in the process of deformation. The appearance of the rolled β structure was regarded as the main cause of deterioration of the thermal stability of this alloy.

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TITLE: "An Investigation on the Vapor Phase Epitaxy of Doped GaAs"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3,
1980 pp 308-317

TEXT OF ENGLISH ABSTRACT: Epitaxial layers of doped GaAs have been prepared from a Ga/AsCl₃/H₂ system in an improved epitaxial apparatus and the vapor-phase doping process of the GaAs has been investigated. The quality of these layers thus obtained was found to be satisfactory and they are used in making microwave devices, such as variators and switches. Discussions on a variety of factors, including surface morphology, growth rate, electronic mobility, breakdown voltage, doping uniformity across a wafer, doping profile, defects and reproducibility of the epitaxy, were made.

AUTHOR: MA Xiangfeng [7456 7449 1496]

ORG: Beijing Institute of Iron and Steel Technology

TITLE: "The Enveloping Method of Determining Cross Roller Shape--A Discussion of 'A Mathematical Treatment of Cross Roller Design'"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3,
1980 pp 318-324

TEXT OF ENGLISH ABSTRACT: According to practice, a general equation for the determination of the cross roller shape has been derived on the basis of the mutual relation between moving stocks and rollers which is further considered as the relation between generating and enveloping surfaces. It appears that this is applicable to the designing calculation of cross roller shapes with either helical or revolving surfaces.

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TITLE: "An Investigation of the Carbon Migration Process in the Welded Joint of a 12AlMoV Steel"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 325-330

TEXT OF ENGLISH ABSTRACT: An investigation of the first kind of migration process of carbon has been carried out on the welded joints of a 12AlMoV steel by means of microscopy, EPMA and dilatometry. It is shown that this carbon migration is caused by the existence of a significant activity gradient of carbon between the two sides of a fusion line. This may take place as a result of the earlier precipitation of pro-eutectoid ferrite on one side of the fusion line within a temperature range in which rapid diffusion of carbon atoms occurs. This confirms the activity reasoning proposed by the author for carbon migration.

The difference of the activity coefficient of carbon caused by different crystal structures is larger than that caused by different compositions of the alloys for these welded joints. Hence, it is the main thermodynamic condition accounting

[Continuation of JINSHU XUEBAO Vol 16 No 3, 1980 pp 325-330]

for this kind of carbon migration. From a kinetic point of view, the degree of carbon migration increases with the duration under certain temperatures. Changing the composition as well as modification of welding technology have been proposed so as to retard or suppress the carbon migration in the welded joints of the steel.

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TITLE: "Some Factors Affecting Welded Joint Fractures in Hot-Rolled Silicon Steel Coils"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 331-335

TEXT OF ENGLISH ABSTRACT: An investigation of the relationships between cold bending plasticity and microstructures of welded joints in hot-rolled silicon steel coil in welded and heat-treated conditions has been carried out by optical microscopy, TEM, SEM and stress analysis. It is shown that the martensite and carbide formed in weld junctions and overheated zones as well as the coarse grains in the overheated zones are the main factors responsible for the welded joint fracture. The intersection of numerous deforming twins in the overheated zones during deformation and their impact against phase boundaries also leads to an initiation of cracks, thus promoting the brittle fracture of the welded joints.

AUTHOR: JIANG Xiaoxia [1203 2556 7209]

ORG: Institute of Metal Research, Chinese Academy of Sciences

TITLE: "An Etching Method for Revealing Carbides in W-containing Alloy Cast Iron"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 336-340

TEXT OF ENGLISH ABSTRACT: The electrochemical behavior of the carbides in W-containing alloy cast iron has been investigated in the basic solution. As a result, the potentiostatic electrolytic and chemical etching method for differentially revealing various carbides in this alloy is proposed.

AUTHOR: GUAN Ruonan [7070 5387 3948]

ORG: Institute of Metal Research, Chinese Academy of Sciences

TITLE: "Calculation of the α Correction Factors for Electron Microprobe Analysis of Oxides and Its Applicability"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 341-348

TEXT OF ENGLISH ABSTRACT: The correction factors for electron microprobe analysis of 14 oxides at an accelerating potential of 20 kV and a take-off angle of 18° have been calculated using a computer program written in the FORTRAN language. The C/K vs C curve was shown to be nonlinear. The errors caused by the supposition of a linear C/K vs C relationship and the use of these α correction factors have been discussed.

AUTHOR: WANG Zuochen [3769 0146 5256]

ORG: Changchun Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Effects of Pb and Mg on the Properties of Long-term Aging Zn-4Al Alloy"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 349-353

TEXT OF ENGLISH ABSTRACT: Tests were made on the effects of Pb and Mg on the property changes of Zn-4Al alloy in 20 years of natural aging. It appears that Pb is favorable to the phase transformation of the alloy which remarkably causes its volume change. Mg dissolves in the Zn alloy within its certain maximum solubility only. This seems to be independent of Pb contamination. The optimum addition of Mg may then be chosen properly. Furthermore, the influence of the presence of Cu was also discussed.

AUTHOR: ZHANG Detang [1728 1795 1016]

ORG: None

TITLE: "Microscopic Identification of AlN"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 354-356

TEXT OF ENGLISH ABSTRACT: A microscopic observation of the AlN phase is made together with EPMA, X-ray or electron diffraction analysis. Its crystalline as well as chemical and mechanical properties are presented, and its original color or optical feature is shown in color photographs.

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TITLE: "Electromigration Phenomenon in Tungsten"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 362-364

TEXT OF ENGLISH ABSTRACT: Hairpin tungsten filaments showed premature failure in conducting direct current. The cause of this failure was interpreted as the superposition of the electromigration and the Soret effect. An effective method has been proposed to improve the life-time of the filament.

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TITLE: "Effects of Concentration and Average Valence of Titanium Subchlorides on the Electrocrystallization of Titanium"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 16 No 3, 1980 pp 365-367

TEXT OF ENGLISH ABSTRACT: The effects of concentration and average valence of titanium subchlorides on the electrocrystallization of titanium in a NaCl-KCl melt have been investigated. When the Ti ion concentration was about 2 percent and the average valence was not higher than 2.4, the crystals obtained were coarse. A possible explanation of this phenomenon is as follows: In NaCl-KCl melts, complex ions of Ti will form, and chemically the Ti^{2+} complex ions are less stable as compared to the Ti^{3+} complex ions. This will lead to comparatively small overpotential in electrodeposition. Therefore, the lower average valence is conducive to the formation of rather coarser crystals. With a view of improving the current efficiency and quality of Ti in the electrolysis of $TiCl_4$ by basket cathode, measures which can raise the concentration of titanium subchlorides as well as lower the average valence, such as adding Ti to the gas-melt interface in the basket, should be adopted.

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